DOCUMENT RESUME

ED 353 847 FL 020 984

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TITLE Bilingual and ESL Approaches to Deaf Education: Perspectives on the Reading Process.
PUB DATE 29 May 92
NOTE 61p.; Master's Thesis, Hunter College, City Univesity of New York.
PUB TYPE Information Analyses (070) -- Dissertations/Theses - Masters Theses (042)

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS *Bilingual Education; *Deafness; Educational History; Educational Strategies; Elementary Secondary Education; *English (Second Language); Language Research; *Reading Instruction; *Reading Processes; Reading Research; Second Language Instruction; *Second Language Learning; *Sign Language

ABSTRACT

A review of literature addresses two main issues: (1) how the acquisition of English by deaf signing children has been understood as an instance of second language learning; and (2) how deaf children learn to read English, given this understanding. The first chapter chronicles the history of language use in deaf education and reviews research on sign language and current second language instruction theory. This is intended to lay a foundation for discussion of the use of bilingual education and English-as-a-Second-Language (ESL) approaches to English instruction for deaf students. Chapter 2 examines theories of first and second language reading as a framework for understanding acquisition of reading by deaf children. This chapter also looks at theory and research on specific aspects of the reading process and relates these findings to use of the bilingual approach to deaf education. It is concluded that several bilingual education models, especially the maintenance model, have potential applications in deaf education and that current second language reading theory can contribute to understanding of the nature of reading acquisition among deaf children. Specific implications are outlined. A 146-item bibliography is included. (MSE)

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BILINGUAL AND ESL APPROACHES TO DEAF EDUCATION: PERSPECTIVES ON THE READING PROCESS

by

Vincent J. Cangiano

Submitted in partial fulfillment of the requirements for the degree of Master of Arts in Teaching English to Speakers of Other Languages, Hunter College, The City University of New York.

1992

Thesis Sponsor:

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Donald R.H. Byrd

May 29, 1992

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PREFACE

The following study was motivated by a desire to understand the nature of language acquisition among deaf children. Many questions fueled this investigation, but two general questions directed its completion: (1) How has the acquisition of English by deaf signing children been understood as an instance of second language learning? and (2) How do deaf children learn to read English given this understanding? These questions ultimately led to the conclusion that broad philosophical orientations regarding language instruction for deaf children (e.g., theories and models from bilingual education programs) should be able to embrace specific research findings (e.g., findings regarding deaf readers and reading processes) and accomodate the intrinsic contradictions.

Chapter 1 offers a brief history of language use in deaf education and a review of sign language research as a foundation for understanding current approaches in language instruction and proposed bilingual education and English-as-a-second-language approaches. Chapter 2 reviews theories of first and second language reading as a general framework for understanding reading acquisition among deaf children. This chapter also examines theory and research that pertain to specific aspects of reading and attempts to relate the findings to the call for a bilingual education approach to

deaf education. Chapter 3 provides a short summary of this investigation and its conclusions.

At the outset, it is important to note that this study is primarily concerned with a limited population--namely, prelingually, profoundly deaf children born to deaf signing parents or raised in an environment in which early and sufficient access to American Sign Language is available. Studies show that approximately 10% of deaf children have deaf parents (Hoffmeister & Wilbur 1980). Unless otherwise indicated, the use of the term "deaf" refers to these learners. Many advocates of a bilingual education approach to the education of deaf children assume this conservative definition. Still, others broaden the definition and the bilingual model to include a range of deaf students.

Finally, I would like to take this opportunity to thank those who have helped make this work possible. I thank my professors for their assistance: David Man, for encouraging my initial study of American Sign Language morphology; Angela Parrino and Martin Gitterman, for their time and their minds; and Donald Byrd, my advisor, for his guidance and support. And I thank my friends and family, for their generosity and understanding.

1. LANGUAGE INSTRUCTION IN DEAF EDUCATION: PAST, PRESENT, AND PROSPECTIVE

> ...yet now and then
> Phrases or words escape or murmurs die,
> Or sounds confronted by some barrier
> Are beaten back, rebound almost, like words
> In some loud foreign language no one knows.
>
> Lucretius, *De Rerum Natura*, Book IV

The past three decades have witnessed a broad range of research studies regarding language and deafness. Descriptive linguistic studies have pursued the fundamental question of whether sign languages are fully-developed languages (e.g., Klima and Bellugi 1979). Neurolinguistic research has explored the nature of brain organization for sign language processing (e.g., Poizner, Klima and Bellugi 1987). Sociolinguistic studies have examined the many varieties of language use within deaf populations (e.g., Bochner and Albertini 1988; Woodward 1980). Psycholinguistic research has investigated the complex processes of reading among deaf students (see King and Quigley 1985 for an overview).

Within the domain of applied linguistics lie theoretical and practical aspects of language use and acquisition among deaf populations (e.g., McAnally, Rose, and Quigley 1987; Quigley and Paul 1984; Strong 1988b). This chapter addresses the question of how the acquisition of English among deaf children can, in general, be understood as a second language

learning experience. Beginning is a brief history of language use in deaf education and an overview of sign language research, followed by a review of the present state of language instruction and an outline of the current advocacy for English-as-a-second-language and bilingual education approaches.

The Changing History of Language Instruction

A review of the literature on deaf education reveals that the issue of language use in the education of deaf children has long been at the center of controversy. Quigley and Paul neatly summarize the present possibilities for language instruction:

> There are two distinct languages, American Sign Language and English, and two distinct communication forms, oral and manual...[that can be] combined in a variety of ways to produce a number of systems or approaches, which can be classified into three general categories: Oral English (OE), Manually Coded English (MCE), and American Sign Language (ASL) (1987:182).

Throughout the history of deaf education in this country, the use of these language approaches has varied.

With the founding of the country's first school for the deaf in 1817 by Thomas Gallaudet, the use of manual-language approaches began (Lane 1980). At first, owing to the school's first teacher, Laurent Clerc, a deaf Frenchman, the manual system was "a cross between Signed French and English," and it employed supplemental signs that were

invented to represent elements of English syntax (Lou 1988). As such, this approach was an early example of a manually-coded form of English. This system was short-lived. Through the influence of local sign languages, the supplemental signs had disappeared by 1835, and American Sign Language (ASL) emerged as the exclusive language of instruction (Lane 1980; Lou 1988).

Towards the end of the century, however, the tide of opinion on language use shifted, and oral English instruction was advocated. One predominant view--as advanced by Alexander Graham Bell and maintained by the Milan Congress on the Education of the Deaf in 1880--held that sign language use would hinder the speech and intellectual development of deaf children (Lane 1980). Coupled with the belief that ASL represented an impoverished form of communication, this view helped to ensure the subsequent reign of the oral-only approach, which saw both the broad prohibition of sign language and discrimination against deaf teachers (Lou 1988; Vernon and Andrews 1990).

During the 1960's, ASL and manual approaches began to achieve a more favorable status once again. Among the contributing factors for this, as cited by Lou (1988) and Vernon and Andrews (1990), are the following: (1) research on sign language and its relation to language acquisition among deaf children, (2) changing perceptions among the majority culture about deaf people, and (3) the gradual emergence of a more visible and politically active Deaf community (see

Padden and Humphreys 1988 for an interesting perspective on Deaf culture). The following section will concern research on sign language structure and acquisition and its contribution to present and prospective possibilities for language instruction.

The Contribution of Sign Language Research

In 1960, William Stokoe, an English teacher at Gallaudet University, published *Sign Language Structure: An Outline of the Visual Communication Systems of the American Deaf,* the first linguistic analysis of American Sign Language. Since the publication of this work, sign language research has yielded a number of important findings. It has exploded the myth that sign languages are universal, having shown, for example, how British Sign Language would be as incomprehensible to a user of American Sign Language as spoken Greek would be to a speaker of English (Marcowicz 1980). It has corrected the misconception that ASL represents English, emphasizing that, as is true for any language, ASL conveys *meaning,* not English (Bockmiller 1981; Marcowicz 1980). And it has challenged the assumption that ASL has no grammar, detailing the ways in which ASL is a fully-developed *language*, distinct from English both in grammar and lexicon (e.g., Klima and Bellugi 1979; Siple 1978; Stokoe, Casterline, and Croneberg 1965; Wilbur 1979, 1980).

The recognition that ASL constitutes a genuine language is of particular importance. It allows ASL to be viewed on its own terms, rather than on the basis of the grammatical or lexical structure of English. Indeed, given any two languages, it is not uncommon for "constructions expressing the same idea to be quite different in structure or order" (Stokoe 1990:130). Thus, if one is to understand ASL with respect to English, one should describe specific elements of ASL as representing *differences* rather than deficiencies. ASL has a grammar; it is merely different from English grammar.

In fact, ASL shares properties with, while differing in significant ways from, spoken languages in general. As with spoken languages, ASL is describable in terms of phonology (or 'cherology'), morphology, and syntax (Klima and Bellugi 1979; Wilbur 1979, 1980). Some of the structures and processes of ASL within these linguistic divisions are similar to those which exist in spoken languages; others are unique to sign languages.

Other research has examined the nature of sign language acquisition. Studies of deaf children who are learning ASL within a signing environment have revealed language acquisition processes and stages similar to those for hearing children learning spoken languages (Erting and Volterra 1990; Fisher 1988; Hoffmeister and Wilbur 1980; Newport and Meier 1986). Deaf children "babble" in sign at an early age

(Angier 1991), they overgeneralize linguistic input, they err, and they progress.

Clearly, sign language research has countered many myths and misunderstandings, which have not been uncommon even among specialists within the field of deafness (Vernon and Andrews 1990). In exchange, a clearer understanding of ASL has emerged, and, as previously stated, the status of ASL and manual languages has improved. The result has been significant.

In recent years, most programs have included manual approaches, thus ending a period of more than a half-century in which oral-only approaches dominated (Lou 1988). As Lou states, "The pendulum has begun to swing back towards manual language and ASL" (1988:94). Still, just how far has the pendulum swung? What specific use of language in deaf education actually prevails?

The Current State of Language Instruction

Concurrent with and facilitating the return to manual approaches was the emergence of a number of manual systems designed to be used in simultaneous conjunction with spoken English. Collectively grouped within the approach called Total Communication (TC), these systems employ a manually-coded form of English (Signed English, Signed Exact English, Linguistics of Visual English, among others), each of which differs in the degree to which it diverges from ASL and

employs English grammatical and lexical structure (Quigley and Paul 1987; Vernon and Andrews, 1990). Differences lie in word order, inflectional morphology, and the use of prepositions and articles. Most of the manual systems attempt to make aspects of the grammatical and lexical forms of English "visible" to the deaf signer (Vernon and Andrews 1990).

Total Communication using spoken English and forms of manually coded English is currently the predominant approach to the education of deaf children (McAnally, Rose, and Quigley 1987). However, herein lies a basic controversy. On the one hand, the philosophy of TC emphasizes the incorporation of communication forms that include gestures, signs, fingerspelling, speech, speechreading, residual hearing, reading, and writing (Lou 1988). On the other hand, though its use is consistent with TC philosophy, American Sign Language--a form of communication that is accessible to deaf children and, indeed, the first language of some (see the following section)--is generally not a component of the TC program (Strong 1988a). Instead, the return to "manual languages" has essentially amounted to the appropriation of ASL signs by manually-coded *systems* that serve the representation and teaching of English (McAnally, Rose, and Quigley 1987). Very few programs exist in which ASL is the language of instruction (Strong 1988a). So, despite more favorable attitudes brought on by sign language research, ASL still has effectively been left out of deaf education.

Total Communication has been subject to much scrutiny, challenged on both theoretical and research grounds (various sources are cited in Lou 1988; Rudser 1988; Strong 1988a). Instructors using TC sign and speak at the same time. To convey simultaneously "structures in each language [or *system*] that cannot be adequately and completely represented in the other" (Vernon and Andrews 1990:112) is cognitively demanding and may cause the normal rate of speech to be reduced or signs to be omitted (Rudser 1988). Moreover, in their current formulations, existing approaches in deaf education have had limited success in developing literacy skills in deaf children in comparison with hearing children; most profoundly deaf students are functionally illiterate as high school graduates (Paul and Quigley 1990; Quigley and Paul 1984; Strong, 1988a).

Other evidence has shown that deaf children who are exposed to a manually-coded form of English, will, without any ASL input, spontaneously generate ASL-like forms (Gee and Goodhart 1988). Gee and Goodhart hypothesize that the human biological capacity for language in the manual mode determines this expression. The manually-coded systems used in TC approximate to some degree the particular syntax and morphology of English. Innate constraints on the manual mode may happen to preclude the possibility that these particular features will occur within a natural sign language (see Gee and Goodhart for a complete discussion; see also Newport and Meier 1986).

In response to the prevailing TC approach of simultaneously communicating in spoken and signed modes, other approaches have been proposed. These approaches appropriate bilingual education models and advocate developing both English *as a second language* and American Sign Language, through a *complementary* rather than simultaneous use of the two languages. The following discussion reviews the nature of such proposals.

The Case for Bilingual Education and ESL Approaches

Throughout the past two decades, concurrent with the extensive adoption of Total Communication programs by schools throughout the country, a number of reports, reviews, proposals, and addresses have emerged advocating approaches to deaf education based on English-as-a-second-language (ESL) and bilingual education models (e.g., Charrow and Fletcher, 1974; Collins-Ahlgren 1974; Goldberg and Bordman 1975; Luetke-Stahlman 1983, 1986; Quigley and Paul 1984; Paul 1987; Stokoe 1975; Strong 1988a; Strong, Woodward, and Burdett 1987; Walworth 1988; Johnson, Liddell, and Erting 1989).

The conclusion that ASL enjoys the status of a genuine language is foundational to a bilingual education approach. The argument behind the advocacy of such an approach runs, roughly, as follows: (1) ASL is a natural language that expresses meaning rather than English; (2) Given an

appropriate social environment and adequate linguistic input, deaf children (i.e., deaf children of deaf signing parents, among others) acquire ASL naturally as their first language; (3) English is linguistically different from ASL; (4) For those for whom ASL is a first language (L1), English should therefore be considered a second language (L2); (5) With ASL as their first language and English as the second, deaf children may benefit, cognitively and linguistically, from a bilingual approach that maintains and encourages the developing L1, ASL, as it develops the L2, English.

As stated previously, before the swing towards simultaneous communication, the traditional oral approach in deaf education had prevailed for more than a half century. Like Total Communication, oral approaches have faced criticism. Luetke-Stahlman (1983) suggests that the oral approach may be--at least for native users of ASL--akin to the direct method of language acquisition for hearing learners, or "submersion" in bilingual programs (see Ovando and Collier 1985 for a detailed discussion of ESL and bilingual education; see also Gamez 1979). This method involves second language instruction only, with no first language support.

The impact on the cognitive processes of language-minority students of curtailing first language use in deference to second language instruction may be significant. Strong, Woodward, and Burdett (1987) cite Cummins' argument that building upon a student's first language base may be

vital for both normal cognitive development and Cognitive/Academic Language Proficiency (CALP) in the second language. CALP involves the cognitively demanding language of academic instruction and includes literacy skills and abstract thought (Ovando and Collier 1985; Wolfson 1989). The acquisition of CALP skills through L1 instruction is thought to facilitate the development of CALP in the L2 (Strong 1988a; see also Cummins 1988).

Reviewing bilingual education theory and research, Quigley and Paul suggest that "under certain learning conditions, access to two languages (e.g., ASL and English) can positively influence the development of cognitive processes, which in turn can lead to higher IQ and academic achievement" (1984:197). Other findings demonstrate that first language instruction for language-minority students is necessary for successful learning of the curriculum (Cummins, as cited in Luetke-Stahlman 1986). These observations have been taken to provide basic *theoretical* justification for encouraging the natural development of ASL as a first language.

Charrow and Fletcher (1974) were among the first to take up, through *empirical* study, the question of whether prelingually deaf children learn English as a second language, and their study is instructive. They administered the Test of English as a Foreign Language (TOEFL) and the Stanford Achievement Test to two groups of deaf adolescents--one with deaf parents, the other with hearing parents. As

the authors propose, for a deaf child with deaf parents who is exposed to ASL as a first language, English may be learned as a second language. The deaf child of hearing parents, learning English without the benefit of a well-developed primary language (e.g., ASL), may experience greater challenges. These proposals have some intuitive appeal, and the results were not inconsistent with their research question: Scores attained by deaf children of deaf parents were higher overall and, on the TOEFL, correlated more significantly with those of hearing, second language students. While the results do not constitute conclusive evidence, the authors suggest that at least some aspects of English may be learned as a second language for some deaf children and that early development of sign language may contribute to subsequent success in English.

The authors of this study also appeal to Lenneberg's critical period hypothesis, which states that successful language acquisition begins at an early age, before the human brain lateralizes language functions (Lenneberg 1967; O'Grady, Dobrovolsky, and Aronoff 1989). If, indeed, there is an early critical period for language learning, and if language acquisition is dependent upon sufficient and *comprehensible* input during this period (see Krashen 1982), then, as the authors suggest, differences found between deaf children of deaf parents and those of hearing parents may be expected. Children of hearing parents may be receiving inadequate linguistic input from spoken English or from

simultaneous spoken and signed English forms (see criticisms in the previous section). Deaf children exposed to ASL from signing parents may therefore have a greater potential for fuller linguistic and cognitive development. Indeed, there are a few other empirical studies that seem to support the hypothesis that those deaf children entering school with a well-developed sign language (as their L1) attain higher levels of academic acheivement in English (see Bockmiller 1981).

Problems with a bilingual education approach have also been cited. Most parents of deaf children are hearing and not fluent users of ASL. Therefore, a program that employs ASL as the first language of instruction may be seen by some parents as weakening their role in the raising of their children (Quigley and Paul 1988). Also, hesitancy about bilingual education programs may emerge from parents' concerns that their children might not be afforded the same opportunity of becoming part of mainstream hearing society. Nevertheless, many deaf adults eventually become part of the deaf community and learn American Sign Language anyway, though they will have done so long after their childhood. As Rudser describes:

> Many adult members of the deaf community are to some extent bilingual in ASL and English, but it is a bilingualism too often born of frustration and pain. Planned bilingual education for deaf children, with the language of their community as the first language, and the language of the majority community as the second is a reasonable approach to the problems facing deaf education today. (1988:106)

The tone of much of the advocacy for the use of ASL appears to reflect the assumption that ASL should be used primarily for the purpose of teaching English, a view consistent with the philosophy of transitional bilingualism. In a transitional model of bilingual education, instruction in the first language and the second are provided until sufficient proficiency in the L2 is achieved, at which time L1 instruction is reduced or eliminated and L2 instruction increases or replaces it (Luetke-Stahlman 1983; Ovando and Collier 1985). Most of the perspectives outlined up to this point are consistent with the transitional model. However, as exemplified by Rudser (above) and others (e.g., Luetke-Stahlman 1983), an approach to educating deaf children that appropriates a maintenance model of bilingualism, in which L1 is maintained as L2 develops, has also been advanced. Much of the discussion so far is also consistent with this model.

Concluding Remarks

There are many calls for bilingual education and ESL approaches to the education of deaf children. Most take as justification some or all of the following considerations (outlined earlier in this chapter): (1) findings from research on sign language and sign language use; (2) the effectiveness of existing approaches in deaf education; and (3) theory and research regarding language acquisition and bilingual education (with hearing learners). Few appeals

offer empirically-based justifications (see Quigley and Paul 1984 for a thorough review; see Vernon and Andrews 1990 for a listing of research studies regarding educational performance among deaf and hearing populations). Still, as some have concluded (e.g., Quigley and Paul 1984; Strong 1988a), the very fact that there are few bilingual programs within deaf education to study may be justification enough for implementing, on a limited scale, an experimental bilingual education program.

Clearly, the numerous issues of language use and instruction are problematic. Quigley and Paul's thorough review (1984) of the issues regarding language instruction in deaf education points to a history of initiations often based on philosophies of language learning rather than empirical research findings (see also Paul and Quigley 1990). While they propose that an ASL/ESL bilingual approach be taken, the authors encourage "reasoned initiation, careful evaluation, and establishment of a data base rather than another sharp swing in linguistic and communication forms" (Quigley and Paul 1984:197). Ultimately, both parents and educators, deaf and hearing alike, must consider whether, for whom, when, and how a bilingual education approach is appropriate in deaf education.

2. DEAFNESS AND SECOND LANGUAGE READING: PROCESSES AND POSSIBILITIES

In the beginning was the Word...

John 1:1

The previous chapter described grounds for understanding the acquisition of English among deaf children as a second language learning experience and for appropriating perspectives from ESL and bilingual education theory in educating deaf children. This chapter addresses the particular question of how the deaf learn to read English. First is a review of principal theories of first and second language reading, which serve as a general framework for understanding reading acquisition among the deaf. Then, theory and research that pertain to specific reading processes (e.g., word-recognition) are examined in order to determine whether the findings can be accommodated by a bilingual approach to deaf education.

Reading Research: Pursuing the Elusive

Languages have evolved naturally in all human societies. During the last few thousand years, writing systems have developed to represent many spoken languages. Spoken

language is generally acquired in a natural manner without great effort or formal instruction. In contrast, the written word poses a set of challenges that many user struggle to meet.

Formal education seeks to assist students in meeting the challenges of reading and writing, taking the promotion of literacy as a fundamental aim. Consequently, one basic pursuit of educational research has been to understand the processes of reading and of reading acquisition. Learning to read is an aspect of language acquisition that has been examined from numerous perspectives. Theories and research from disciplines as varied as first and second language reading acquisition, educational and cognitive psychology, linguistics, and neuroscience have been brought to bear on the evolving body of knowledge regarding reading processes.

The reading process has been one of the most elusive objects of human enquiry. To grasp its nature requires, as Edmund Huey suggested in 1908, an understanding of "many of the most intricate workings of the human mind" (cited in Henderson 1984b). Understanding the reading process demands knowledge of what essentially cannot be seen. Nevertheless, investigations of numerous aspects of the reading process have been undertaken, and some have yielded cogent theoretical models.

Models of the First Language Reading

A century of reading theory and research has revealed that reading is a complex cognitive activity. During reading, various levels of textual information and reader resources are available. One way that models of reading have differed is in the choice of factors at different levels seen as significant to successful reading comprehension. Among the many models of reading, three principle models have been delineated: (1) bottom-up, (2) top-down, and (3) interactive models.

Bottom-up models stress the importance of text-based aspects such as vocabulary, syntax, and other elements present in the text (Quigley and Paul 1984). For instance, one focus of bottom-up models is word recognition. An important question concerns the extent to which an analytic process of sounding out words (phonological coding) and a holistic one of whole-word recognition (visual coding) are available and necessary for access to word meaning.

Top-down models place the focus on reader-based aspects such as prior knowledge, inferencing ability, prediction and other resources that the reader brings to the text (Quigley and Paul 1984). From a top-down perspective, reading is a "psycholinguistic guessing game," in which prior linguistic and world knowledge and the sampling of textual details yield predictions that lead to the construction of textual meaning (Goodman 1970, 1988). In contrast to bottom-up models, a

top-down view of reading would, for example, de-emphasize the role of phonological coding in word recognition (Eskey 1986, 1988).

Interactive models generally incorporate aspects of both bottom-up and top-down models. According to this model, successful reading requires (1) the processing of phonological and syntactic information, and relationships, that determine the words and sentences of the text, and (2) the prior world knowledge and cognitive skills of the reader (see Carrell, Devine, and Eskey 1988). Bottom-up and top-down processes are seen to operate in parallel, though variably, with 'schemata' acting as frameworks for organizing new information with existing knowledge (Anderson and Pearson 1988; Quigley and Paul 1984; Seidenberg and McClelland 1986). Put simply, an interactive view of reading sees reading as "a kind of dialogue between the reader and the text" (Grabe 1988:56). While these models attempt to describe the processes of reading in a first language, they have also been applied to second language reading (e.g., Carrell, Devine, and Eskey 1988).

Interactive Models of Second Language Reading

Approaches to second language reading have drawn strength, in particular, from interactive models of reading (Carrell 1988). Top-down factors such as background knowledge, schemata, and inferencing skills, as well as

bottom-up factors such as vocabulary and syntactic recognition, are considered relevant for both first and second language readers (see Carrell, Devine, and Eskey 1988). Still, there are ways in which the interaction of these factors to facilitate reading may differ between L1 and L2 readers.

When children begin learning to read in their first language, they generally bring with them well-established cognitive and linguistic abilities and resources. Beginning readers already have, for example, a large spoken-language vocabulary. The meanings of new words encountered in writing are likely to be understood as soon as the child can map the written forms to familiar spoken-language equivalents. While second language learners may possess well-developed skills in L1, they generally begin reading in L2 with a corresponding spoken-language vocabulary that is limited. Even though the second language reader of an alphabetic writing system may have developed adequate skill in phonological analysis, she may, nevertheless, be denied access to semantic information on account of limitations in prior L2 knowledge (e.g., spoken-language vocabulary, figurative language, etc.)

Reading acquisition in a second language involves many considerations. Grabe (1988) oulines a number of variables which may influence L2 reading development: (1) reading experience in L1, (2) reasons for I1 reading, (3) transfer of L1 reading skills to L2 reading, (4) the relation between L1 and L2 orthographies, and (5), as exemplified above, prior L2

knowledge. Additionally, a factor assumed to be a given in bilingual education is general language competence from the natural and adequate development of a first language (see the next section). Within second language reading theory, some of these variables find acceptance; others face criticism. Still, if we are able to understand the general acquisition of English by deaf signing children as a form of second language learning, it should also be possible to view reading acquisition among deaf learners within the framework of second language reading theory.

Deaf Readers, the Second Language Reading Model, and Bilingual Education

Grabe's outline underscores the complexity of L2 reading acquisition, emphasising the importance of L1 literacy. Bilingual education models also stress the role of L1 reading in L2 reading development. Four developmental stages of an approach using the minority-language are delineated by Paul (1987): (1) early instruction in the L1 only, (2) reading and writing development in the L1, (3) instruction via the L1 and the L2, and (4) reading and writing development in the L2. Immediately, it is obvious that, with regard to a bilingual approach to deaf education, "only 1,3 and 4 are possible to implement because ASL does not have a written component" (Paul 1987:12).

The lack of a written form of ASL is not inconsequential if L1 reading skill is a significant determining factor in L2 reading ability. Deaf learners of English could thus be compared to second language learners who are illiterate in their first language. L1 literacy is not a requisite for L2 instruction for hearing adult learners, but, as indicated above, it is generally encouraged in bilingual programs for children (Note stage 2). Here, the interactive model of second language reading is descriptive, if not predictive, of the challenges deaf children face in learning to read English as their second language.

If there were a written form of ASL, the discussion above might provide added support for a bilingual (ASL/English) approach to deaf education. In this scenario, ASL (L1) literacy would be developed as a foundation for English (L2) reading acquisition. Apparently, a few attempts to develop a written form of sign language are underway. (One computer-based approach is cited in Bellugi et al. 1989 and McAnally, Rose, and Quigley 1987).

Four of the five variables listed by Grabe (above) involve L1 literacy. The fifth relates to prior L2 knowledge (see Devine 1988 for a discussion). Like L2 learners, deaf readers may begin reading without the English language knowledge that native speakers have when learning to read. Both adult education (i.e., ESL instruction) and bilingual education programs for children encourage developing some degree of spoken language competence in the L2 prior to L2

reading instruction. Currently, the parallel to this practice within deaf education is found in programs that aim to develop speechreading (or lipreading) and speech production skills, employ amplification technology, and, subsequently, develop literacy skills. (For a discussion of curricular approaches in deaf education, see Bunch 1987; Quigley and Paul 1984, 1987). Such measures may result in a general awareness of the linguistic structure of English (see later sections of this paper). Thus, the assumption that prior L2 oral knowledge is a factor in L2 reading would seem to justify an early focus on developing English language skills within a bilingual approach to deaf education.

An alternative to maintaining that L2 spoken language competence is fundamental to L2 reading (as is the case for hearing L2 learners) is to require that at least some linguistic code be present for the reading task. For example, in the Grammar-Translation approach to acquiring classical languages--though often considered outdated for learning modern languages (Richards and Rodgers 1986; Ovando and Collier 1985)--readers often develop significant reading knowledge of a foreign language without the ability to produce or to comprehend the spoken form of that language. In such an approach, the readers may be transferring their L1 phonology in processing the L2 text and interpreting the L2 grammar and vocabulary with reference to their L1. Likewise, deaf readers may be able to employ a sign-based code to read (Hirsh-Pasek and Treiman 1984). One possibility for

exploiting this potential resource within a bilingual program might be an approach that develops ASL as the L1 *and* a form of manually-coded English (as the primary representation of the L2), upon which L2 reading could be built.

Addressing the question of the coding strategies employed in reading and reading acquisition (e.g., to what extent speech-based or sign-based coding are used by readers) involves examining fairly specific bottom-up processes. An interactive view of reading, which attempts to integrate both top-down and bottom-up models coherently, should be able to account for research pertaining to both lower-level and higher-level processes in reading (Grabe 1988). Grabe states that

> the very nature of interactive models suggests that higher-level processing abilities play a significant role. Exactly how these processes interact...is a question for further research. At the same time...interactive models strongly imply that many lower-level processing skills are basic to good reading. Such a view suggests that methods of instruction for rapid visual recognition, for extensive vocabulary development, and for syntactic pattern recognition should become major pedagogical research concerns" (1988:63).

These general perspectives from L2 reading theory apply equally well to reading theory and research particular to deaf learners, the subject of the next section.

Deaf Readers and Reading Processes

That deaf students have difficulty achieving performance in English literacy skills comparable to that of hearing

students is well documented (various sources are cited in Quigley and Paul 1987). Interactive models of second language reading indicate many directions for investigating the challenges deaf children face in reading English. In research regarding prelingually, profoundly deaf readers of English, an important pursuit has been defined by the question of how deaf children learn to read a script that systematically represents the phonemes of the language when little or no access to the sounds of spoken English is available to them? (Paul 1987). To tackle this question, this section reviews reading theory and research regarding different populations and different orthographies, and raises the issue of phonological coding versus visual coding in word recognition, both of which are seen as "bottom-up" processes. To what extent must, can, and do readers make use of phonological and visual information in accessing meaning from print?

Beginning and fluent hearing readers. One way of understanding the role of phonological and visual coding is to consider the differences among readers at different levels of reading development. When hearing children begin learning to read, they generally arrive at the task with well-established cognitive and linguistic abilities and resources. Already, significant lexical and grammatical knowledge has been acquired through spoken language development. Deriving meaning from print is therefore thought to require the

additional knowledge of the associations between the basic units of print and the sounds of the spoken language (Gleitman et al. 1989). Learning the concise, albeit complex, set of rules of sign-sound correspondence allows one to translate, or recode, the marks on the page--letters, letter clusters, words, and sentences--into their spoken language equivalents. This particular feature of alphabetic orthographies promises the beginning reader the rapid expansion of his vocabulary, which may be a significant factor in reading comprehension (LaSasso and Davey 1987). The phonics approach to early reading instruction exploits this alphabetic principle, and it takes as a priority the development among beginning readers of an awareness of the systematic sign-sound rules of English (Adams 1990).

In contrast, fluent (non-beginning) readers are seen to rely less upon phonological coding. Having automatized the identification of familiar words, they seem able to access meaning directly by a visual, holistic route from printed words (Singer 1984). Indeed, the notion of visual recognition of words is often taken for granted--evidenced among some readers, for example, by reading rates that seem by far to exceed normal speaking or listening comprehension rates (Rozin and Gleitman 1977). Fluent readers hardly appear to be "sounding out" the words they read. In a statement not inconsistent with such observations, Singer says that "phonological processing may not be necessary for

teaching beginning reading, but it greatly facilitates learning to read" (1984:203).

Hearing readers of different orthographies. Another suggestion is that the issue of visual and phonological coding during reading depends upon what orthography the reader is dealing with. Each of the three basic writing systems--alphabets, syllabaries, and logographies--relates the basic unit of writing, the grapheme, to the spoken language in a distinct manner. The grapheme of an alphabet, the letter, is mapped onto the spoken language at the level of the phoneme. In a syllabary, the grapheme corresponds to the syllable. And the basic unit of a logography, the character, represents a word or morpheme.

Spoken English is represented by an alphabetic orthography in which 26 letters map roughly 44 phonemes in a relatively systematic way. Chinese uses a logographic orthography with many thousands of characters, each of which maps a distinct word or morpheme. This difference has often been taken to imply that English words are primarily processed analytically, with the reader tending to rely more upon phonological recoding for access to word-meaning (Lee, Stigler, and Stevenson 1986), and that Chinese characters may be processed holistically, with the reader being able to access word-level semantic information more directly and without phonological mediation (see Taylor and Taylor 1983 for a discusion). Although some have pointed out that the

majority of Chinese characters contain a phonetic component as well as a semantic component (these components are often called 'radicals'), others have suggested that the phonetic component--due to historical change in the Chinese language--provides little assistance in identifying a character (see Lee, Stigler, and Stevenson 1986; Taylor and Taylor 1983).

The availability of semantic information in recognizing familiar words is, in general, taken for granted. Upon recognizing a word in print, a proficient reader will readily, and unavoidably, access stored semantic information about the word. This conclusion has been observed through Stroop tests, in which response times for identifying the color of patches of ink are compared with those for identifying the ink color of distracting printed color names (Hoosian 1986). When the print is in red ink but reads *blue*, for example, and subjects are asked to name only the color of the ink, greater response time, as a possible result of interference, is observed. Moreover, the interference is greater in a Stroop test of logographic print, namely, in identifying the ink color of a Chinese character printed in red but meaning *blue*, than in one using alphabetic print (Biederman and Tsao 1979). The implied conclusion is that "the meanings of Chinese characters are more manifest than the meanings of words in English" (Hoosian 1986: 60) and therefore interfere more significantly with the color-naming task. Such observations seem consistent with the discussion above regarding the nature of Chinese characters.

Other research (e.g., Tzeng, Hung, and Garro 1978; Tzeng, Hung, and Wang 1977) suggests that the conclusion that phonological recoding is unneccesary in reading Chinese may be unwarranted. Still, as Hoosian suggests, "the possibility remains that the relation between visual and phonological processing might be different for Chinese, because of its unique orthography" (1986:62). This possibility has been taken as the point of departure for a number of studies pursuing the question of the availability of orthographic, phonological, and semantic information for deaf readers.

Hearing and deaf readers of English and Chinese. Many researches have appealed to these general observations regarding phonological and visual coding among beginning and fluent hearing readers and among readers of alphabetic and logographic orthographies in order to understand the situation of deaf readers. One possibility sugested by such observations is that deaf readers of Chinese may have a different experience than deaf readers of English. If they are able to bypass phonological coding more readily and still have access to lexical meaning, deaf readers of Chinese might thus have an advantage not shared by deaf readers of English.

One study experimented with the use of Chinese characters to represent English words in teaching American children with reading difficulties (Rozin, Poritsky, and Sotsky 1973). They reported success in teaching second-grade students to read Chinese characters representing English

material. The results were provocative, but criticized for being limited in scope: very few students learning a small sample of Chinese characters (Hoosian 1986; Taylor and Taylor 1983).

A recent study (Fok et al. 1991) examined hearing and deaf early elementary school students in America and China. The deaf subjects had profound hearing loss and were acquiring American Sign Language or Chinese Sign Language, which are independent of English and Chinese, respectively. Writing samples written in response to familar pictures were elicited in order to examine the approach taken by these subjects with respect to the very different orthographies of English and Chinese. Some interesting results were documented.

First, the results indicated that the incidence of phonologically-based and visually-based errors within each group differed (suggesting different interference patterns across the groups). The errors of the American hearing subjects tended to be phonologically-based, such as writing *pno* for 'piano'. The phonologically-based errors of the Chinese hearing subjects were fewer and tended to involve substituting a character representing a homophone of the target word. Few errors of a phonological nature occurred among the American deaf, and none occurred among the Chinese deaf subjects. The errors of the American deaf subjects included letters and word shapes with features visually similar to those of the target words. Among the errors of

the Chinese deaf subjects were incorrect characters that included the same semantic component as the target character, such as writing the character representing *chicken* for the picture of a duck--both characters contain the same visual semantic component meaning *bird* (Fok et al. 1991).

Second, deaf subjects attempted to apply principles from their respective sign languages to the writing task. In responding to the picture of an Indian, many deaf American subjects wrote the word beginning with the letter *f* ; the fingerspelled F is also the handshape for the ASL sign INDIAN. For *chair*, one Chinese deaf subject produced the characters representing *four, square,* and *shape;* describing aspects of size and shape to name an object is a common feature of Chinese Sign Language (Fok et al. 1988, 1991).

Based on the findings from their investigation, Fok et al. (1991) concluded that a non-phonological route is employed by both American and Chinese deaf children in processing, respectively, the English and Chinese orthographies. Indeed, their study seems to support and extend Hoosian's suggestion (1986; noted above) that the relation between visual and phonological processing may be different among English and Chinese readers, given the differing orthographies.

However, it is important at this point to raise the distinction between word and sentence processing during reading. Up to this point, the discussion has focused on word recognition. As the following section indicates, the

inner representation of, and access to semantic information about, individual lexical items may be quite different from representation and comprehension of connected text. Word-recognition is but one component, albeit a fundamental one, of reading.

Poor and skilled hearing and deaf readers. As discussed, observations suggest the possibility that, as far as word-recognition is concerned, phonological coding may not be necessary, and visual coding may be sufficient. However, studies of sentence processing among poor and skilled hearing readers reveal contrary conclusions, namely, that phonological coding is probably necessary, and visual coding may *not* be sufficient (Liberman, Shankweiler, and Liberman 1989 and Shankweiler 1989 provide solid discussions). Successful reading comprehension in English requires short-term memory (STM), which seems to rely upon phonological structure to store information most efficiently (Liberman, Shankweiler, and Liberman 1989 and Taylor and Taylor 1983 cite sources). Other studies have shown that reading in Chinese, in contrast to word-recognition, may also require phonological coding for the same reason (Tzeng, Hung, and Garro 1978; Tzeng, Hung, and Wang 1977; cf. Treiman, Baron, and Luk 1981).

One study of metalinguistic awareness, the ability to reflect upon and use the structural units of spoken language, found that phonological awareness, in particular, is

fundamental to phonological coding (Tunmer 1989). He points out that skilled readers generally have more experience reading, and thus may further develop their phonological coding skills and syntactic awareness (Tunmer 1989). As discussed previously, the more automatized lower-level processes such as word-recognition become (e.g., through more rapid internal coding), the more the reader can focus on higher-level tasks of text comprehension (Singer 1984).

A number of studies by Hanson and others (e.g., Hanson 1989; Hanson and Fowler 1987) suggest that successful deaf readers, even profoundly deaf readers, make use of a "phonological" code during reading. Developing sensitivity to phonological units is considered an important factor in successful reading acquisition. Hanson points out that phonological linguistic units "are not sounds, but rather a set of meaningless primatives out of which meaningful units are formed" (1989:73). The profoundly deaf child may be able to develop awareness of and to learn *about* English phonology through the articulatory gestures of speech production, experience with speechreading, or experience with the orthography itself (Hanson 1989). The developing reader may be able to use these routes to phonology as a means of coding reading material (see Hirsh-Pasek and Treiman 1984 for a review of coding strategies).

Integrating the Findings

Although research on poor and skilled reading hightlights the important distinction between word-recognition and higher-level reading comprehension (e.g., phrase or sentence level), research and hypotheses regarding differences in word-level visual information processing among hearing and deaf readers (and their processing of different orthographies) need not be cast aside. As the interactive model of reading suggests, the varying processes and levels of information (e.g., orthographic, phonological, and semantic information in lexical processing; see Seidenberg and McClellend 1986) work cooperatively to meet the challenges of the reading task. For example, exploiting the potential among deaf children for non-phonological strategies in word-recognition (see Fok et al. 1991) may enable the development of a large sight vocabulary, a factor generally considered significant to successful reading. At the same time, approaches that develop awareness of the phonological units of the language may yield the coding strategies required for better sentence processing.

If phonological coding is required for successful reading among deaf readers, then developing phonological awareness in deaf students should be a priority. Certainly, a bilingual (ASL/English) approach can accommodate this imperative by incorporating appropriate elements of natural and structured approaches to English instruction, including

speech and speechreading (see McAnally, Rose, and Quigley 1987 for a related discussion). However, these findings need not imply that efforts to develop oral skills be pursued exclusively or that attempts to include ASL be abandoned (Quigley and Paul 1984). Indeed, it is possible that ASL can contribute to the development of general metalinguistic awareness and phonological awareness in particular. Here, an appropriate comparison can be made with the idea of transferable language skills among hearing children. It was noted earlier that beginning L1 readers generally arrive at the task of reading with much prior linguistic knowledge from their L1. As Shankweiler states, "through experience with speech, they know how to construct grammatical sentences and interpret them" (1989:39). Since deaf children's access to spoken English is often limited, ASL can assume the role of the L1 in developing general language competence and, perhaps, metalinguistic resources as well. For example, ASL itself can be understood in phonological (or segmental) terms by reference to the meaningless components of its 'cherological' system that combine to form the morphemes and words of the language. Thus, the general concepts and awareness of phonemes (via the awareness of cheremes), morphemes, and grammatical relations may be learnable through ASL as a first language (alongside English as the second).

Alternative (or 'augmentative') communication techniques (Moores 1980) have been, and can continue to be, explored. One example was the use of Blissymbols, a system of writing

(invented by Charles Bliss) with features similar to both logographies and alphabets (Helfman 1981; McNaughton 1980). Another, currently in planning, involves a computer-based writing system (cited in Bellugi et al. 1989 and McAnally, Rose, and Quigley 1987). Such a writing system based on ASL would provide its native users with literacy skills that, assuming the variables noted earlier relating to L2 reading, could have transfer effects on the acquisition of English literacy skills.

At the same time, a writing system would be a means of recording and transmitting knowledge of values of deaf culture and the larger contexts in which deaf people find themselves. Other possibilities exist that may serve this function. For example, Quigley and Paul (1984) suggest the meaningful use of video books produced in ASL, a possibility that amplifies the notion of literacy. Interactive multimedia technology offers a potential for developing English language skills as well, by using real-time video of ASL material and English text in a variety of combinations to develop both receptive and productive skills (Hanson and Padden 1989, 1990).

3. SUMMARY AND CONCLUSIONS

This investigation was prompted by a desire to understand the nature of language acquisition among deaf children. The first chapter, motivated by the general question of how the acquisition of English by deaf signing children can be understood as an instance of second language learning, outlined the logic behind arguments for a bilingual approach to deaf education. The second chapter, inspired by the specific question of how deaf children learn to read English, attempted to relate perspectives on reading and deafness gained from existing reading theory and research, to a bilingual (ASL/English) model of deaf education. This chapter will summarize the investigation and draw together its conclusions.

As stated in Chapter 1, deaf education has witnessed many changes in terms of language instruction, from the early use of sign language, through a period of oral-only instruction, to the recent formulation of simultaneous oral and manual English embodied in the Total Communication approach. Sign language research played a contributing role in the renewed acceptance of manual approaches through its description of American Sign Language as a fully-developed language, distinct from English in grammar and lexicon. Research has also found that many deaf children of deaf signing parents learn ASL fluently as their first language, progressing in their acquisition along a developmental course

in much the same way that hearing children acquire their spoken language. Still, the use of ASL in current language instruction is rare, a situation many educators have criticized. Researchers have noted that current approaches have been unable to significantly improve the educational levels of most deaf students. Many have blamed the distorted linguistic input resulting from the heavy cognitive demands of simultaneous communication. These observations have been taken to provide justification for implementing a bilingual education model for the education of deaf children--at minimum, for those born to signing parents.

Bilingual education has established several models of language instruction, at least one of which--the maintenance model--has potential applications to the education of deaf children. The maintenance model accommodates the continued development of the first language while instruction in English as a second language gradually increases. Developing transferable cognitive and linguistic skills through the L1 (e.g., ASL) is a fundamental principle of the model and particularly applicable to the language learning situation of the deaf child for at least two reasons: (1) Access to only the target language, which is particularly limited in the case of the deaf child learning English, may impair the very development of cognitive and linguistic skills, and (2) Delaying adequate linguistic access beyond the critical period may significantly compromise the development of such skills. These reasons represent, in short, the important

variables of intake and age. In addition, other social and cultural reasons for considering a bilingual education model have been offered, e.g., the difficulties many deaf adults face in becoming part of the Deaf community as they attempt to learn ASL after a long education that excluded its use.

Those advocating a bilingual education approach to deaf education offer ample support for such a proposal. Whether this approach could benefit students with varying degrees of hearing impairment is a matter for future consideration. For prelingually, profoundly deaf children of deaf signing parents, bilingual instruction, in general, seems reasonable to implement and would extend the available options within deaf education. An effective program would require a plan for class, daily, and annual sequencing and allotment of both English and American Sign Language instruction. The plan would make provisions for content courses and language instruction, including ESL, as deemed appropriate.

The fact that certain broad theoretical perspectives and research findings from bilingual education seem fitting for deaf education does not imply that corresponding methodologies and materials will be immediately transferable: For instance, adaptations of popular ESL textbooks will provide no quick correctives to the difficulties deaf children experience in acquiring English. Instead, advocates of a bilingual education approach must begin with a thorough understanding of the principles, processes, and possibilities of language acquisition among this population by appealing to

existing knowledge from varied disciplines. In this way, knowledge of specific aspects of language learning among the deaf can be appropriately situated within and inform the proposed bilingual education framework. Understanding the way in which such knowledge relates to the broader framework proposed was precisely the purpose in addressing, in Chapter 2, the more specific question of how deaf children learn to read English.

As stated in Chapter 2, a century of reading theory and research has yielded an understanding that reading is a complex cognitive activity. During reading, various levels of textual information and reader resources are available. Models of the reading process differ in terms of which factors at specified levels they view as significant to successful reading. Bottom-up models of reading emphasize letter-perception, word recognition, and sentence comprehension, that is, the processing of information available within the text. Top-down models place emphasis on a reader's prior knowledge, inferencing skills, and prediction ability, that is, resources the reader brings to the text. Recent interactive approaches to reading incorporate aspects of both models and recognize the role of reader-based as well as text-based variables in the reading process.

Interactive models of reading provide a compelling account of what reading research has learned. Second language reading theory has also been informed by such

models. Given the force of arguments outlined in Chapter 1 for relating general perspectives from bilingual education and studies of second language acquisition to deaf education, it seems logical that, in particular, second language reading theory may similarly contribute to understanding the nature of reading acquisition among deaf children. A comprehensive analysis of the potential applications of bilingual education models and second language reading theory was clearly beyond the scope of this paper. Instead, particular aspects of bottom-up reading processes, including phonological and visual coding, were considered. The importance of such variables do not go unrecognized by interactive models of second language reading.

The question of how deaf children learn to read a language they have never heard is a difficult one to address. Observations regarding beginning and fluent readers, as well as studies comparing poor and skilled readers, hearing and deaf readers, and readers of different orthographies have offered perspectives on addressing this question. Findings suggest that while visual coding is possible in word-recognition, phonological coding that is facilitated by phonological awareness may be required by short-term memory for the larger tasks of reading.

The last section offered perspectives on how a bilingual education approach to deaf education might yet be able to accommodate these findings. Several perspectives that

pertain to justification for the ASL component of a blingual approach can be summarized as follows:

1. Early and adequate input in ASL (as the L1) encourages a natural development of cognitive skills and real-world knowledge in and through a *language*.

2. General language competence may be transferable from the L1 (ASL) to the L2 (English).

3. ASL can serve in the development of general metalinguistic awareness.

4. Mastery of the concepts and facility in the use of the phonological (segmental) units of ASL may contribute to the effort to develop the corresponding phonological awareness of English that occurs through L2 instruction.

5. If a written form of ASL were developed, ASL instruction could include among its aims the development of L1 reading skills, which may factor into L2 literacy acquisition.

Similarly, the English component of a bilingual approach can be informed by findings from reading research in the following way:

1. Phonological awareness of English can emerge through the articulatory gestures of speech production, experience with speechreading, or experience with the orthography itself if appropriate elements of natural and structured approaches to English instruction are included.

2. The development of spoken and written English skills can be achieved through English language instruction in cooperation with ASL through current and future applications of multimedia technology.

3. English instruction would be able to exploit the potential for visual processing strategies among deaf children who sign by employing both whole-word and phonics approaches to vocabulary development.

Rather than swinging between different approaches to language instruction, it seems feasible to reenvision the current Total Communication approach. Instead of the simultaneous use of signed and spoken forms, a *complementary* approach using a bilingual (ASL/English) model may be a reasonable option. This option would provide a new formula for Total Communication without undermining its general philosophy. Initiating experimental programs may be required in order to generate further justification for a bilingual approach. Finally, other justification may be the desire among parents for additional options in educating their deaf children.

REFERENCES

Adams, M.J. 1990. *Beginning to read: Thinking and learning about print.* Cambridge: MIT Press.

Anderson, R.C., and Pearson, P.D. 1988. A schema-theoretic view of basic processes in reading comprehension. In *Interactive approaches to second language reading,* ed. P. Carrell, J. Devine, and D. Eskey, 37-55. Cambridge: Cambridge University Press.

Angier, N. 1991. Deaf babies use their hands to babble, researcher finds. *New York Times,* 22 March.

Bauer, Laurie. 1988. *Introducing Linguistic Morphology.* Edinburgh: Edinburgh University Press.

Bellugi, U. 1980. How signs express complex meanings. In *Sign language and the deaf community,* ed. C. Baker and R. Battison. Silver Spring, MD: National Association of the Deaf.

Bellugi, U., O'Grady, L., Lillo-Martin, D., O'Grady, M., van Hoek, K., and Corina, D. 1990. Enhancement of spatial cognition in hearing and deaf children. In *From gesture to language in hearing and deaf children,* ed. V.Volterra and C. Erting, 278-298. New York: Spring-Verlag.

Bellugi, U., Tzeng, O.J.L., Klima, E.S., and Fok, Y.Y.A. 1989. Dyslexia: Perspectives from sign and script. In *From reading to neurons,* ed. A.M. Galaburda, 137-172. Cambridge: MIT Press/Bradford Books.

Biederman, I., and Tsao, Y-C. 1979. On processing Chinese ideographs and English words: Some implications from Stroop-Test results. *Cognitive Psychology* 11:125-132.

Bochner, J.H. and Albertini, J.A. 1988. Language varieties in the deaf population and their acquisition by children and adults. In *Language learning and deafness,* ed. M Strong, 3-48. Cambridge: Cambridge University Press.

Bockmiller, P.R. 1981. Hearing-impaired children: Learning to read a second language. *American Annals of the Deaf,* 126:810-813.

Brooks, P.H. 1978. Some speculations concerning deafness and learning to read. In *Deaf children: Developmental perspectives,* ed. L.S. Liben, 97-101. New York: Academic Press.

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Brown, H.D. 1987. *Principles of language learning and teaching.* 2nd ed. Englewood Cliffs, NJ: Prentice-Hall.

Bunch, G.O. 1987. The curriculum and the hearing-impaired student: *Theoretical and practical considerations.* Boston: College-Hill.

Carrell, P. 1988. Introduction: Interactive approaches to second language reading. In *Interactive approaches to second language reading,* ed. P. Carrell, J. Devine, and D. Eskey, 1-7. Cambridge: Cambridge University Press.

Carrell, P., Devine, J., and Eskey, D., eds. 1988. *Interactive approaches to second language reading.* Cambridge: Cambridge University Press.

Charrow, V.R., and Fletcher, J. D. 1974. English as the second language of deaf children. *Developmental Psychology* 10:463-470.

Collins-Ahlgren, M. 1974. Teaching English as a second language to young deaf children: A case study. *Journal of Speech and Hearing Disorders* 39:486-500.

Coltheart, M. 1984. Writing systems and reading disorders. In *Orthography and reading: Perspectives from cognitive psychology, neuropsychology, and linguistics,* ed. L. Henderson, 67-79. Hillsdale, NJ: Erlbaum.

Conrad, R. 1972. Speech and Reading. In *Language by ear and eye: The relationships between speech and reading,* ed. J.F. Kavanagh and I.G. Mattingly. Cambridge: MIT Press.

Coulmas, F. 1984. Arbitrariness and double articulation in writing. In *Orthography and reading: Perspectives from cognitive psychology, neuropsychology, and linguistics,* ed. L. Henderson, 57-66. Hillsdale, NJ: Erlbaum.

Crystal, D. 1987. *The Cambridge encyclopedia of language.* Cambridge: Cambridge University Press.

Cummins, J. 1988. Second language acquisition within bilingual education programs. In *Issues in second language acquisition: Multiple perspectives,* ed. L.M. Beebe, 145-166. New York: Newbury House.

Devine, J. 1988. The relationship between general language competence and second language reading proficiency: Implications for teaching. In *Interactive approaches to second language reading,* ed. P. Carrell, J. Devine, and D. Eskey, 260-277. Cambridge: Cambridge University Press.

Duran, R. 1987. Factors affecting development of second language literacy. In *Becoming literate in English as a*

second language, ed. S.R. Goldman and H.T. Trueba, 33-55. Norwood, NJ: Ablex.

Erting, C. and Volterra, V. 1990. Conclusion. In *From gesture to language in hearing and deaf children*, ed. V.Volterra and C. Erting, 278-298. New York: Spring-Verlag.

Eskey, D.E. 1986. Theoretical foundations. In *Teaching second language reading for academic purposes*, ed. F. Dubin, D.E. Eskey, and W. Grabe, 3-23. Reading, MA: Addison-Wesley.

_____. 1988. Holding in the bottom: An interactive approach to the language problems of second language readers. In *Interactive approaches to second language reading*, ed. P. Carrell, J. Devine, and D. Eskey, 93-100. Cambridge: Cambridge University Press.

Fisher, S. 1978. Sign languages and creoles. In *Understanding language through sign language research*, ed. P. Siple. New York: Academic.

Fok, Y.Y.A, Bellugi, U., van Hoek, K., and Klima, E.S. 1988. The formal properties of Chinese languages in space. In *Cognitive aspects of the Chinese language*, ed. I.M. Liu, H.C. Chen, and M.J. Chen, 187-205. Hong Kong: Asian Research Service.

Fok, Y.Y.A, van Hoek, K., Klima, E.S., and Bellugi, U. 1991. The interplay between visuospatial language and visuospatial script. In *Advances in cognition, education, and deafness*, ed. D.S. Martin, 127-145. Washington, DC: Galludet University Press.

Furth, H. 1973. *Deafness and learning: A psychosocial perspective*. Bemont, CA: Wadsworth.

Gámez, G.I. 1979. Reading in a second language: "Native language approach" vs "direct method". *The Reading Teacher* 32:665-670.

Gee, J.P. and Goodhart, W. 1988. American Sign Language and the biological capacity for language. In *Language learning and deafness*, ed. M Strong, 49-74. Cambridge: Cambridge University Press.

Genessee, F. 1988. Neuropsychology and second language acquisition. In *Issues in second language acquisition: Multiple perspectives*, ed. L.M. Beebe, 81-112. New York: Newbury House.

Gleitman, L., Gleitman, H., Landau, B., and Wanner, E. 1989. Great expectations. In *From reading to neurons*, ed. A.M. Galaburda. Cambridge: MIT Press/Bradford Books.

Goldberg, P., and Bordman, M.B. 1975. The ESL approach to teaching English to hearing-impaired students. *American Annals of the Deaf* 120:22-27.

Goodman, K. 1970. Psycholinguistic universals in the reading process. *Journal of Typographic Research* 4:103-110; reprint, 1973. In *Psycholinguistics and reading*, ed. F. Smith. New York: Holt, Rinehart and Winston.

_____. 1988. The reading process. In *Interactive approaches to second language reading*, ed. P. Carrell, J. Devine, and D. Eskey, 11-21. Cambridge: Cambridge University Press.

Grabe, W. 1986. The transition from theory to practice in teaching reading. In *Teaching second language reading for academic purposes*, ed. F. Dubin, D.E. Eskey, and W. Grabe, 25-48. Reading, MA: Addison-Wesley.

Hakuta, K. 1986. *Mirror of language: The debate on bilingualism*. New York: BasicBooks.

Hakuta, K., Ferdman, B.M., and Diaz, R.M. 1987. Bilingualism and cognitive development: Three perspectives. In *Advances in applied psycholinguistics, Volume 2: Reading, writing, and language learning*, ed. S. Rosenberg, 284-319. Cambridge: Cambridge University Press.

Hanson, V.L. 1982. Short-term recall by deaf signers of American Sign Language: Implications for order recall. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 8:572-583.

_____. 1988. Reassessing the term "interactive". In *Interactive approaches to second language reading*, ed. P. Carrell, J. Devine, and D. Eskey, 56-70. Cambridge: Cambridge University Press.

_____. 1989. Phonology and reading: Evidence from profoundly deaf readers. In *Phonology and reading disability: Solving the reading puzzle*, ed. D. Shankweiler and I.Y. Liberman, 69-89. Ann Arbor, MI: The University of Michigan Press.

Hanson, V.L., and Fowler, C.A. 1987. Phonological coding in word reading: Evidence from hearing and deaf readers. *Memory and Cognition* 15:199-207.

Hanson, V.L., Liberman, I.Y., and Shankweiler, D. 1984. Linguistic coding by deaf children in relation to beginning reading success. *Journal of Experimental Child Psychology* 37:378-393.

BEST COPY AVAILABLE

Hanson, V.L., and Padden, C.A. 1989. Interactive video for bilingual ASL/English instruction of deaf children. *American Annals of the Deaf* 134:209-213.

_____. 1990. Computers and videodisc technology for bilingual ASL/English instruction of deaf children. In *Cognition, education, and multimedia,* ed. D. Nix and R. Spiro, 49-63.

Harris, A.E. 1978. The development of the deaf individual and the deaf community. In *Deaf children: Developmental perspectives,* ed. L.S. Liben, 217-233. New York: Academic Press.

Harris, D., and Vanderheiden, G.C. Enhancing the development of communicative interaction. In *Nonspeech language and communication: Analysis and intervention,* ed. R.L. Schiefelbusch. Baltimore, MD: University Park Press.

Hasuike, R., Tzeng, O., and Hung, D. 1986. Script effects and cerebral lateralization: The case of Chinese characters. In *Language processing in bilinguals: Psycholinguistic and neuropsychological perspectives,* ed. J. Vaid, 275-288.

Helfman, E.S. 1981. *Blissymbolics: Speaking without speech.* New York: Elsevier-Dutton.

Henderson, L. 1982. *Orthography and word recognition in reading.* New York: Academic Press.

_____. 1984a. Writing systems and reading processes. In *Orthography and reading: Perspectives from cognitive psychology, neuropsychology, and linguistics,* ed. L. Henderson, 11-24. Hillsdale, NJ: Erlbaum.

_____, ed. 1984b. *Orthography and reading: Perspectives from cognitive psychology, neuropsychology, and linguistics.* Hillsdale, NJ: Erlbaum.

Hirsh-Pasek, K., and Treiman, R. Recoding in silent reading: Can the deaf child translate print into a more manageable form? In Reading and the hearing-impaired individual, ed. R.E. Kretchmer. *Volta Review* 84:71-82.

Hoffmeister, R. and Wilbur, R. 1980. The acquisition of sign language. In *Recent perspectives on American Sign Language,* ed. H. Lane and F. Grosjean, 61-78. Hillsdale, NJ: Erlbaum.

Hoosian, R. 1986. "Perceptual processes of the Chinese. In *The psychology of the Chinese people,* ed. M.H. Bond, 38-72. Hong Kong: Oxford University Press.

Johnson, R.E., Liddell, S.K., and Erting, C.J. 1989. *Unlocking the curriculum: Principles for achieving access in deaf education.* Gallaudet Research Institute Working Paper 89-3. Washington, DC: Gallaudet University.

King, C.M., and Quigley, S.P. 1985. *Reading and deafness.* San Diego, CA: College-Hill Press.

Klima, E.S. 1972. How alphabets might reflect language. In *Language by ear and eye: The relationships between speech and reading,* ed. J.F. Kavanagh and I.G. Mattingly. Cambridge: MIT Press.

Klima, E.S., and Bellugi, U. 1979. *The signs of language.* Cambridge: Harvard University Press.

Krakow, R.A., and Hanson, V.L. 1985. Deaf signers and serial recall in the visual modality: Memory for signs, fingerspelling, and print. *Memory and Cognition* 13:265-272.

Krashen, S.D. 1982. *Principles and practices in second language acquisition.* Oxford: Pergamon Press.

Lane, H. 1980. A chronology of the oppression of ign language in France and the United States. In *Recent perspectives on American Sign Language,* ed. H. Lane and F. Grosjean, 119-161. Hillsdale, NJ: Erlbaum.

LaSasso, C. and Davey, B. 1987. The relationship between lexical knowledge and reading comprehension for prelingually, profoundly hearing-impaired students. *The Volta Review* 89:211-220.

Lee, S.Y., Stigler, J.W., and Stevenson, H.W. 1986. Beginning reading in Chinese and English. In *Acquisition of reading skills: Cultural constraints and cognitive universals,* ed. B.R. Foorman and A.W. Siegel, 123-150. Hillsdale, NJ: Erlbaum.

Lenneberg, E.H. 1967. *Biological foundations of language.* New York: John Wiley and Sons.

Liben, L.S. 1978. The development of deaf children: An overview of issues. In *Deaf children: Developmental perspectives,* ed. L.S. Liben, 3-20. New York: Academic Press.

Liberman, I.Y., Shankweiler, D., and Liberman, A.M. 1989. The alphabetic principle and learning to read. In *Phonology and reading disability: Solving the reading puzzle,* ed. D. Shankweiler and I.Y. Liberman, 1-33. Ann Arbor, MI: The University of Michigan Press.

Liberman, I.Y., Shankweiler, D., Liberman, A.M., Fowler, C., Fischer, F.W. 1977. Phonetic segmentation and recoding in the beginning reader. In *Toward a psychology of reading: The proceedings of the CUNY Conference*, ed. A.S. Reber and D.S. Scarborough. Hillside, NJ: Erlbaum.

Lillo-Martin, D. In press. Deaf Readers and Universal Grammar. In *Psychological perspectives of deafness*, ed. M. Marschark and D. Clark. Hillsdale, NJ: Erlbaum.

Lillo-Martin, D. 1991. Deaf readers' comprehension of complex syntactic structure. In *Advances in cognition, education, and deafness*, ed. D.S. Martin, 146-151. Washington, DC: Galludet University Press.

Liu, I.M. "Chinese cognition." 1986. In *The psychology of the Chinese people*, ed. M.H. Bond, 73-105. Hong Kong: Oxford University Press.

Lou, M.P. 1988. The history of language use in the education of the Deaf in the United States. In *Language learning and deafness*, ed. M Strong, 75-98. Cambridge: Cambridge University Press.

Luetke-Stahlman, B. 1983. Using bilingual instructional models in teaching hearing-impaired students. *American Annals of the Deaf* 128:873-877.

_____. 1986. Building a language base in hearing-impaired students. *American Annals of the Deaf* 131:220-228.

Marcowicz, H. 1980. Myths about American Sign Language. In *Recent perspectives on American Sign Language*, ed. H. Lane and F. Grosjean, 1-6. Hillsdale, NJ: Erlbaum.

Marshall, J.C. 1987. The cultural and biological context of written language: Their acquisition, deployment, and breakdown. In *Cognitive approaches to reading*, ed. J.R. Beech and A.M. Colley, 15-30. New York: John Wiley and Sons.

_____. 1989. The description and interpretation of acquired and developmental reading disorders. In *From reading to neurons*, ed. A.M. Galaburda, 69-86. Cambridge: MIT Press/Bradford Books.

Martin, D.S., ed. 1985. *Cognition, education, and deafness: Directions for research and instruction*. Washington, DC: Galludet University Press.

Mattingly, I.G. 1972. Reading, the linguistic process, and linguistic awareness. In *Language by ear and eye: The*

relationships between speech and reading, ed. J.F. Kavanagh and I.G. Mattingly. Cambridge: MIT Press.

Maxwell, M.M. 1986. Beginning reading and deaf children. *American Annals of the Deaf* 131:14-20.

McAnally, P.L., Rose, S., and Quigley, S.P. 1987. *Language learning practices with deaf children*. Boston: College-Hill Press.

McLaughlin, B. 1987. Reading in a second language: Studies with adult and child learners. In *Becoming literate in English as a second language*, ed. S.R. Goldman and H.T. Trueba, 57-70. Norwood, NJ: Ablex.

McNaughton, S., and Kates, B. 1980. The application of Blissymbolics. In *Nonspeech language and communication: Analysis and intervention*, ed. R.L. Schiefelbusch. Baltimore, MD: University Park Press.

Moores, D.F. 1978. Current research and theory with the deaf: Educational implications. In *Deaf children: Developmental perspectives*, ed. L.S. Liben, 173-193. New York: Academic Press.

_____. 1980a. Alternative communication modes. In *Nonspeech language and communication: Analysis and intervention*, ed. R.L. Schiefelbusch. Baltimore, MD: University Park Press.

_____. 1980b. American Sign Language: Historical perspectives and current issues. In *Nonspeech language and communication: Analysis and intervention*, ed. R.L. Schiefelbusch. Baltimore, MD: University Park Press.

Muchisky, D.M. 1983. Relationships between speech and reading among second language learners. *Language Learning* 33: 77-102.

Newport, E., and Meier, R. 1986. Acquisition of American Sign Language. In *The cross-linguistic study of language acquisition volume 1: The data*, ed. D. Slobin, 881-938. Hillsdale, NJ: Erlbaum.

Nickerson, R.S. 1978. On the role of vision in language acquisition by deaf children. In *Deaf children: Developmental perspectives*, ed. L.S. Liben, 115-134. New York: Academic Press.

Odlin, T. 1989. *Language transfer: Cross-linguistic influence in language learning*. Cambridge: Cambridge University Press.

O'Grady, W., Dobrovolsky, M., and Aronoff, M. 1989. *Contemporary linguistics: An introduction.* New York: St. Martin's.

Osherson, D.N., and Lasnik, H., eds. 1990. *Language: An invitation to cognitive science, Volume 1.* Cambridge: MIT Press.

Ovando, C.J., and Collier, V.P. 1985. *Bilingual and ESL classrooms: Teaching in multicultural contexts.* New York: McGraw-Hill.

Padden, C., and Humphreys, T. 1988. *Deaf in America: Voices from a culture.* Cambridge: Harvard University Press.

Paul, P.V. 1987. Perspective on using American Sign Language to teach English as a second language. *Teaching English to Deaf and Second Language Students* 5(3):10-16.

Paul P.V., and Quigley S.P. 1990. *Education and deafness.* New York: Longman.

Perfetti, C.A., and McCutchen, D. 1987. Schooled language competence: Linguistic abilities in reading and writing. In *Advances in applied psycholinguistics, Volume 2: Reading, writing, and language learning,* ed. S. Rosenberg, 105-141. Cambridge: Cambridge University Press.

Poizner, H., Klima, E.S., and Bellugi, U. 1987. *What the hands reveal about the brain.* Cambridge: MIT Press.

Quigley, S.P., and Paul, P.V. 1987. Deafness and language development. In *Advances in applied psycholinguistics, Volume 1: Disorders of first-language development,* ed. S. Rosenberg, 180-219. Cambridge: Cambridge University Press.

Quigley, S.P., and Paul, P.V. 1984. *Language and deafness.* San Diego, CA: College-Hill Press.

Quinn, L. 1981. Reading skills of hearing and congenitally deaf children. *Journal of Experimental Child Psychology* 32:139-161.

Richards, J.C., and Rodgers, T.S. 1986. *Approaches and methods in language teaching: A description and analysis.* Cambridge: Cambridge University Press.

Rodda, M., and Grove, C. 1987. *Language, cognition, and deafness.* Hillside, NJ: Erlbaum.

Rozin, P., and Gleitman, L.R. 1977. The structure and acquisition of reading II: The reading process and the acquisition of the alphabetic principle. In *Toward a psychology of reading: The proceedings of the CUNY*

BEST COPY AVAILABLE

Conference, ed. A.S. Reber and D.S. Scarborough. Hillside, NJ: Erlbaum.

Rozin, P., Poritsky, S., and Sotsky, R. 1971. American children with reading problems can easily learn to read English words represented by Chinese characters. *Science* 171:1264-1267; reprint, 1973. In *Psycholinguistics and reading*, ed. F. Smith, 105-115. New York: Holt, Rinehart and Winston (page references are to reprint edition).

Rudser, S.F. 1988. Sign language instruction and its implications for the Deaf. In *Language learning and deafness*, ed. M Strong, 99-112. Cambridge: Cambridge University Press.

Ryan, E.B., and Ledger, G.W. 1984. Learning to attend to sentence structure: Links between metalinguistic development and reading. In *Language awareness and learning to read*, ed. J. Downing and R. Valtin, 149-171. New York: Springer-Verlag.

Sacks, O. 1989. *Seeing voices: A journey into the world of the deaf*. Berkeley: University of California Press.

Schlesinger, H.S. 1978. The acquisition of signed and spoken language. In *Deaf children: Developmental perspectives*, ed. L.S. Liben, 69-85. New York: Academic Press.

Shankweiler, D. 1989. How problems of comprehension are related to difficulties in decoding. In *Phonology and reading disability: Solving the reading puzzle*, ed. D. Shankweiler and I.Y. Liberman, 35-68. Ann Arbor, MI: The University of Michigan Press.

Siedenberg, M.S., and McClelland, J.L. 1989. Visual word-recognition and pronunciation: A computational model of acquisition, skilled performance, and dyslexia. In *From reading to neurons*, ed. A.M. Galaburda, 255-303. Cambridge: MIT Press/Bradford Books.

Singer, H. 1984. Learning to read and skilled reading: Multiple systems interacting within and between the reader and the text. In *Language awareness and learning to read*, ed. J. Downing and R. Valtin, 193-206. New York: Springer-Verlag.

Siple, P., ed. 1978. *Understanding language through sign language research*. New York: Academic.

Smith, F. 1988. *Understanding reading*. 4th ed., Hillsdale, NJ: Erlbaum.

Smith, P.T., Meredith, T.R., Pattison, H.M., and Sterling, C.M. 1984. The representation of internal word structure in English. In *Orthography and reading: Perspectives from cognitive psychology, neuropsychology, and linguistics,* ed. L. Henderson, 103-120. Hillsdale, NJ: Erlbaum.

Sperling, G. 1978. Future prospects in language and communication for the congenitally deaf. In *Deaf children: Developmental perspectives,* ed. L.S. Liben, 103-114. New York: Academic Press.

Stokoe, W.C. 1975. The use of sign language in teaching English. *American Annals of the Deaf* 120:417-421.

_____. 1976. The study of sign language. *Sign Language Studies* 10:1-36; reprint, 1980. The study and use of sign language. In *Nonspeech language and communication: Analysis and intervention,* ed. R.L. Schiefelbusch. Baltimore, MD: University Park Press (page references are to reprint edition).

_____. 1978. *Sign language structure.* Revised ed., Silver Spring, MD: Linstok.

_____. 1990. An historical perspective on sign language research: A personal view. In *Sign language research: Theoretical issues,* ed. C. Lucas, 1-8. Washington, DC: Galludet University Press.

Stokoe, W.C., Casterline, D.C., and Croneberg, C.G. 1976. *A dictionary of American Sign Language on linguistic principles.* Revised ed., Silver Spring, MD: Linstok.

Streng, A.H., Kretschmer, R.R., and Kretschmer, L.W. 1978. *Language, learning, and deafness: Theory, application, and classroom management.* New York: Grune and Stratton.

Strong, M. 1988a. A bilingual approach to the education of young deaf children: ASL and English. In *Language learning and deafness,* ed. M Strong, 113-129. Cambridge: Cambridge University Press.

_____, ed. 1988b. *Language learning and deafness.* Cambridge: Cambridge University Press.

Strong, M., Woodward, J., and Burdett, J. 1987. A bilingual/ESL approach to the education of deaf children. *Teaching English to Deaf and Second Language Students* 5(1):8-14.

Swisher, M.V. 1989. The language-learning situation of deaf students. *TESOL Quarterly* 23:239-257.

Taylor, I., and Taylor, M.M. 1983. *The psychology of reading.* New York: Academic Press.

Treiman, R., and Hirsh-Pasek, K. 1983. Silent reading: Insights from second-generation deaf readers. *Cognitive Psychology* 15:39-65.

Treiman, R., Baron, J., and Luk, K. 1981. Speech recoding in silent reading: A comparison of Chinese and English. *Journal of Chinese Linguistics* 9:116-125.

Tzeng, O.J.L., and Singer, H, eds. 1981. *Perception of print: Reading research in experimental psychology.* Hillsdale, NJ: Erlbaum.

Tzeng, O.J.L., and Wang, W.S.Y. 1983. The first two R's. *American Scientist,* 71:238-243.

Tzeng, O.J.L., Hung, D.L., and Wang, W.S.Y. 1977. Speech recoding in reading Chinese characters. *Journal of Experimental Psychology: Human Learning and Memory* 3:621-630.

Tzeng, O.J.L., Hung, D.L., and Garro, L. 1978. Reading the Chinese characters: An information processing view. *Journal of Chinese Linguistics* 6:287-305.

Valtin, R. 1984. Awareness of features and functions of language. In *Language awareness and learning to read,* ed. J. Downing and R. Valtin, 227-260. New York: Springer-Verlag.

_____. 1984. The development of metalinguistic abilities in children learning to read and write. In *Language awareness and learning to read,* ed. J. Downing and R. Valtin, 207-226. New York: Springer-Verlag.

Vellutino, F.R., and Scanlon, D.M. 1987. Linguistic coding and reading ability. In *Advances in applied psycholinguistics, Volume 2: Reading, writing, and language learning,* ed. S. Rosenberg, 1-69. Cambridge: Cambridge University Press.

Vernon, M. and Andrews, J.F. 1990. *The psychology of deafness: Understanding deaf and hard-of-hearing people.* New York: Longman.

Walworth, M. 1988. ASL and bilingual education. *Teaching English to Deaf and Second Language Students* 7(1):27-30.

Webster, A. 1986. *Deafness, development, and literacy.* New York: Methuen and Company.

Wilbur, R. 1979. *American Sign Language: Linguistic and applied dimensions.* San Diego, CA: College Hill.

_____. 1980. The linguistic description of American Sign Language. In *Recent perspectives on American Sign Language*, ed. H. Lane and F. Grosjean, 7-31. Hillsdale, NJ: Erlbaum.

Wolfson, N. 1989. *Perspectives: Sociolinguistics and TESOL.* New York: Newbury House.

Woodward, J. 1980. Some sociolinguistic aspects of French and American sign languages. In *Recent perspectives on American Sign Language*, ed. H. Lane and F. Grosjean, 103-118. Hillsdale, NJ: Erlbaum.